Sol solar system

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The Sun is a 4.5 billion-year-old yellow dwarf star – a hot glowing ball of hydrogen and helium – at the center of our solar system. It’s about 93 million miles (150 million kilometers) from Earth and it’s our solar system’s only star. Without the Sun’s energy, life as we know it could not exist on our home planet.

From our vantage point on Earth, the Sun may appear like an unchanging source of light and heat in the sky. But the Sun is a dynamic star, constantly changing and sending energy out into space. The science of studying the Sun and its influence throughout the solar system is called heliophysics.

The Sun is the largest object in our solar system. Its diameter is about 865,000 miles (1.4 million kilometers). Its gravity holds the solar system together, keeping everything from the biggest planets to the smallest bits of debris in orbit around it.

The hottest part of the Sun is its core, where temperatures top 27 million °F (15 million °C). The part of the Sun we call its surface – the photosphere – is a relatively cool 10,000 °F (5,500 °C). In one of the Sun’s biggest mysteries, the Sun’s outer atmosphere, the corona, gets hotter the farther it stretches from the surface. The corona reaches up to 3.5 million °F (2 million °C) – much, much hotter than the photosphere.

The Sun has been called by many names. The Latin word for Sun is “sol,” which is the main adjective for all things Sun-related: solar. Helios, the Sun god in ancient Greek mythology, lends his name to many Sun-related terms as well, such as heliosphere and helioseismology.

Our Sun is a medium-sized star with a radius of about 435,000 miles (700,000 kilometers). Many stars are much larger – but the Sun is far more massive than our home planet: it would take more than 330,000 Earths to match the mass of the Sun, and it would take 1.3 million Earths to fill the Sun's volume.

The Sun is about 93 million miles (150 million kilometers) from Earth. Its nearest stellar neighbor is the Alpha Centauri triple star system: red dwarf star Proxima Centauri is 4.24 light-years away, and Alpha Centauri A and B – two sunlike stars orbiting each other – are 4.37 light-years away. A light-year is the distance light travels in one year, which equals about 6 trillion miles (9.5 trillion kilometers).

The Sun rotates on its axis as it revolves around the galaxy. Its spin has a tilt of 7.25 degrees with respect to the plane of the planets’ orbits. Since the Sun is not solid, different parts rotate at different rates. At the equator, the Sun spins around once about every 25 Earth days, but at its poles, the Sun rotates once on its axis every 36 Earth days.

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The Sun formed about 4.6 billion years ago in a giant, spinning cloud of gas and dust called the solar nebula. As the nebula collapsed under its own gravity, it spun faster and flattened into a disk. Most of the nebula's material was pulled toward the center to form our Sun, which accounts for 99.8% of our solar system’s mass. Much of the remaining material formed the planets and other objects that now orbit the Sun. (The rest of the leftover gas and dust was blown away by the young Sun's early solar wind.)

The Sun has several regions. The interior regions include the core, the radiative zone, and the convection zone. Moving outward – the visible surface or photosphere is next, then the chromosphere, followed by the transition zone, and then the corona – the Sun’s expansive outer atmosphere.

Once material leaves the corona at supersonic speeds, it becomes the solar wind, which forms a huge magnetic "bubble" around the Sun, called the heliosphere. The heliosphere extends beyond the orbit of the planets in our solar system. Thus, Earth exists inside the Sun’s atmosphere. Outside the heliosphere is interstellar space.

The core is the hottest part of the Sun. Nuclear reactions here – where hydrogen is fused to form helium – power the Sun’s heat and light. Temperatures top 27 million °F (15 million °C) and it’s about 86,000 miles (138,000 kilometers) thick. The density of the Sun’s core is about 150 grams per cubic centimeter (g/cm³). That is approximately 8 times the density of gold (19.3 g/cm³) or 13 times the density of lead (11.3 g/cm³).

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